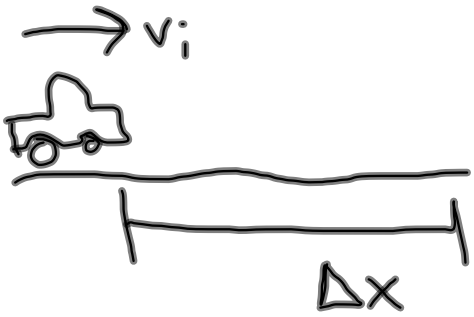
An automobile with an initial speed of 4.30 m/s accelerates uniformly at the rate of 3.00 m/s/s. Find the final speed and the displacement after 5.00 s.

$V_i = 4.30\ m/s \quad a = 3.00\ m/s^2 \quad t = 5.00\ s$

$V_f = ? \quad \Delta x = ?$



$$V_f = V_i + at$$

$$= 4.30\ m/s + (3\ m/s^2)(5\ s)$$

$$= 19.3\ m/s$$

$$\Delta x = v_i t + \frac{1}{2} a t^2$$

$$= (4.3\ m/s)(5\ s) + \frac{1}{2}(3\ m/s^2)(5\ s)^2$$

$$= 59\ m$$

Kinematics Practice Problems 1.31.12 Honors Physics

Billy accelerates his skateboard uniformly along a straight path from rest to 12.5 m/s in 2.5 s.
a) What is Billy's acceleration?
b) What is Billy's displacement during this time interval?
c) What is Billy's average velocity during this time interval?

$V_i = 0\ m/s \quad V_f = 12.5\ m/s \quad t = 2.5\ s$

a) $V_f = V_i + at$

$a = \frac{V_f - V_i}{t}$

$= \frac{12.5\ m/s - 0\ m/s}{2.5\ s}$

$= 5\ m/s^2$

b) $\Delta x = V_i t + \frac{1}{2} a t^2$

$= \frac{1}{2}(5\ m/s^2)(2.5\ s)^2$

$= 15.63\ m$

c) $\bar{V}_{avg.} = \frac{\text{total displacement}}{\text{total time}}$

$= \frac{15.63\ m}{2.5\ s}$

$= 6.25\ m/s$

A certain car is capable of accelerating at a uniform rate of 0.85 m/s/s. What is the magnitude of the car's displacement as it accelerates uniformly from a speed of 83 km/h to one of 94 km/h?

$a = 0.85\ m/s^2$

$v_i = 83\ km/h \cdot \frac{1\ h}{3600\ s} \cdot \frac{1000\ m}{1\ km} = 23.1\ m/s$

$v_f = 94\ km/h \rightarrow 26.1\ m/s$

$\Delta x = ?$

$$v_f^2 = v_i^2 + 2a\Delta x$$

$$\Delta x = \frac{v_f^2 - v_i^2}{2a} \neq \frac{(v_f - v_i)^2}{2a}$$

$$= 88.3\ m$$

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needed to assume $v_i = 0$ m/s

$v_f = 33$ m/s $\quad \Delta x = 240$ m

$a = ?$

$$v_f^2 = v_i^2 + 2a\Delta x$$

$$a = \frac{v_f^2 - v_i}{2\Delta x}$$

$$= 2.3 \text{ m/s}^2$$